Magellan Systems Japan, Inc.

MSJ Company Overview and Tech Information.
EU-JPN GNSS Week, 2017

マゼランシステムズジャパン株式会社
Magellan Systems Japan Inc.

Revision 2.0

Company Profile

Profile

(Company Profile)

Our Location : 7-1-3, Doicho, Amagasaki, Hyogo, 660-0083, Japan (near Osaka)
Established on : February, 1987 Capital : JPN Yen 526,900,000.
No of Engineers : 15 (8 in Moscow R&D)

(Major Activities)

- High Precision GNSS RTK Solution
- Unique Ultra Tight Coupling Solution between IMU and GNSS
- Ultra Sensitive GPS timing solution (S/W or H/W)

(Advantages)

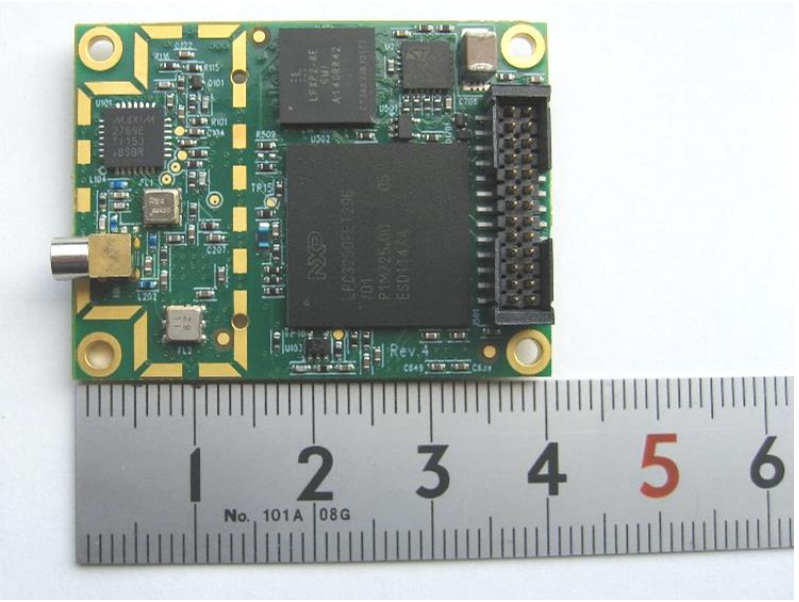
Magellan Systems Japan, Inc (MSJ) is a unique company, having a low cost but high precision Multi GNSS RTK solution and IMU. Our advanced ultra tight coupling between GNSS and IMU allows optimal machine control. Our products can also be optimized to perfectly fit the customer's applications.

(Current Business)

- Deliver/Develop Solutions to Major Tractor, Construction & Industrial Machine Companies
- Deliver/Develop Solutions to Major Drone and Robotics Manufacturers

マゼランシステムズジャパン株式会社
Magellan Systems Japan Inc.

High Precision L1 Multi GNSS RTK Module



- Dimensions・・・・・・・・・・・・・・・・・ 30 x 40 x 12 mm
- Weight ・・・・・・・・・・・・・・・・・・・ 12 g
- Input Voltage ・・・・・・・・・・・・ 4 ～ 6 VDC
- Back-Up Voltage ・・・・・・・・・・ 2.6 ～ 6 VDC
- Power Consumption ・・・・・・・・ 0.5 ～ 0.7W
- Antenna Power Output ・・・・・ 2.8V , 30mA
- Connectors ・・・・・・・・・・・・・・・ 26 pins for digital
  MMCX for antenna
- Operation Temperature ・・・・ -40℃ ～ +85℃

Tracking Signals

GPS			GLONASS			Galileo (optional)				QZSS (optional)				SBAS (optional)
L1	L2	L5	L1	L2	L3	E1	E5a	E5b	E6	L1	L2	L5	LEX	
○			○			○				○				○

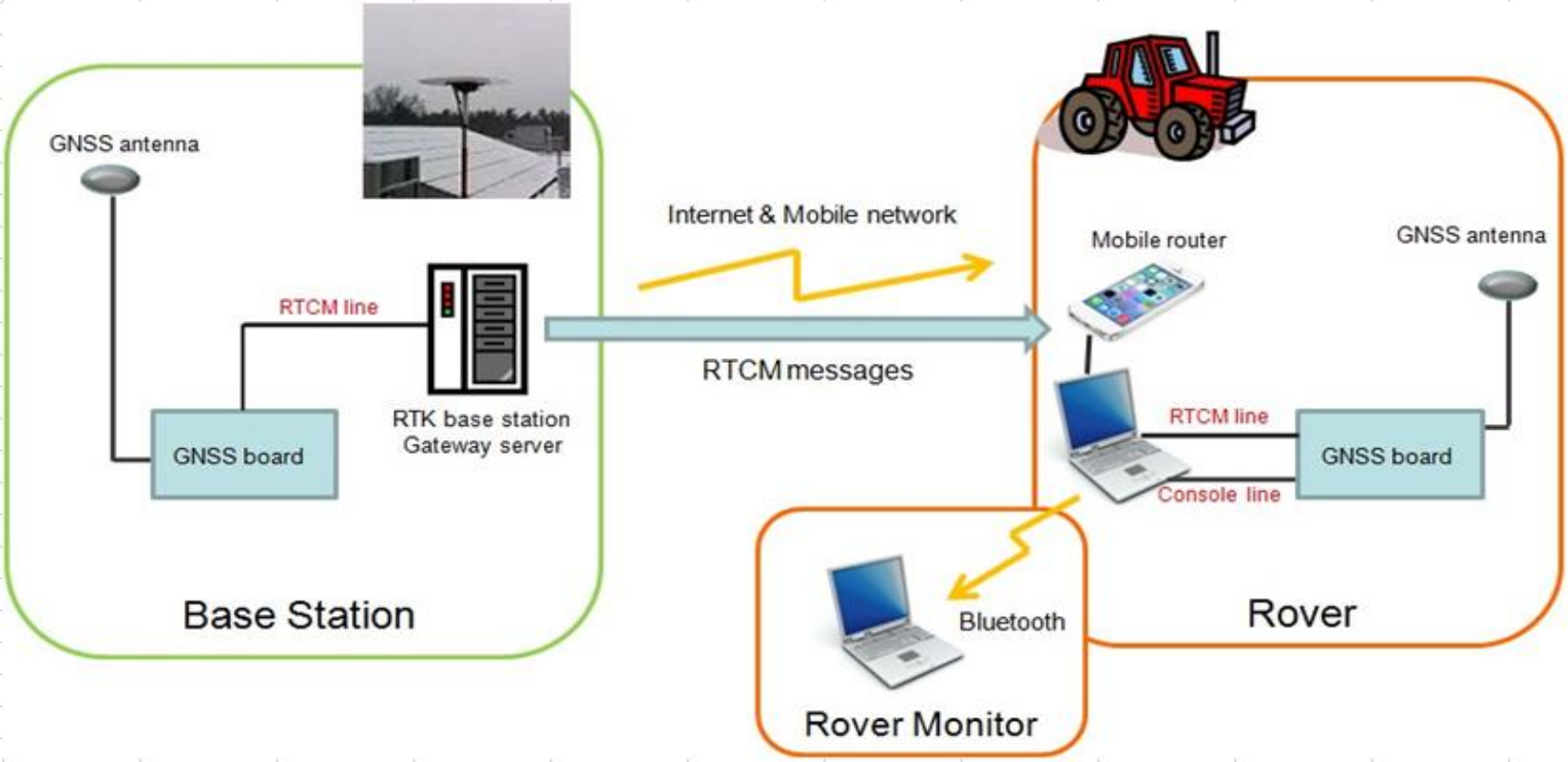
マゼランシステムズジャパン株式会社
Magellan Systems Japan Inc.

Demonstration

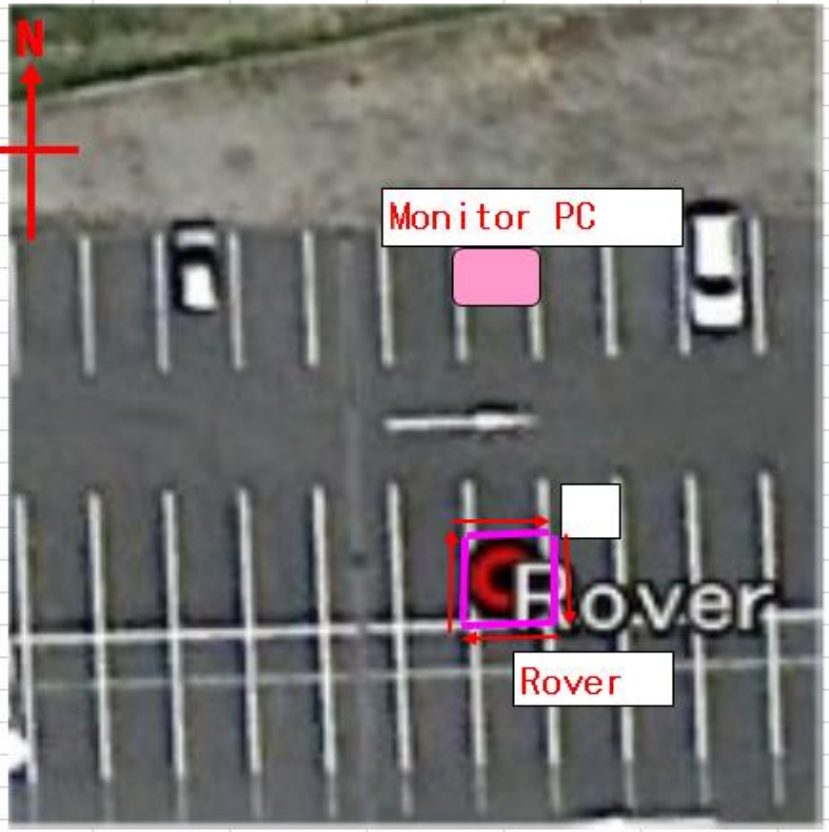
Demonstration

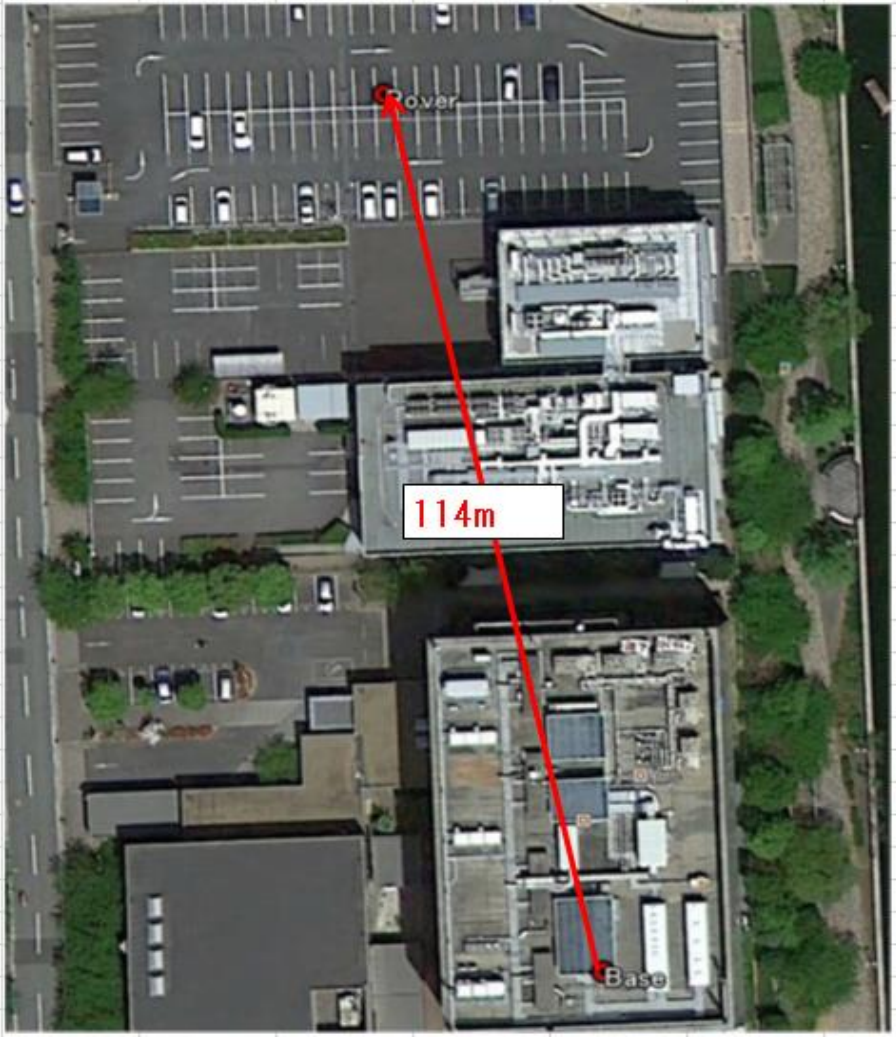
GNSS Board Test Report (RTK)

Antenna BaseStation : GrAnt-G3(JAVAD)
Rover : MJ-3006-GL1-ANT(MSJ)
Parking place of Aric
Date: 2016/05/02 05:00:00 ～ 05:10:00(UTC)
F/W : c50r



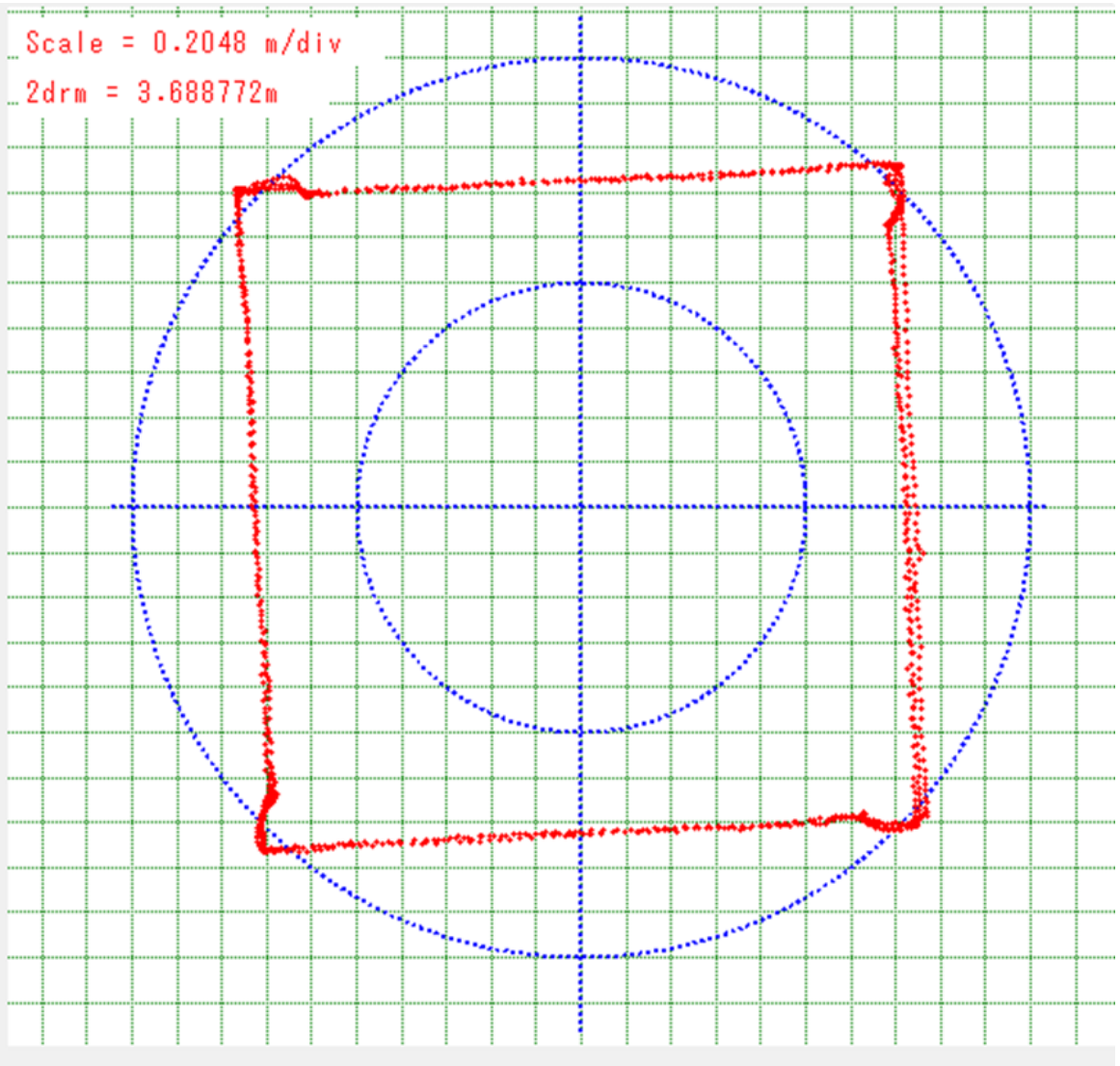
Demonstration

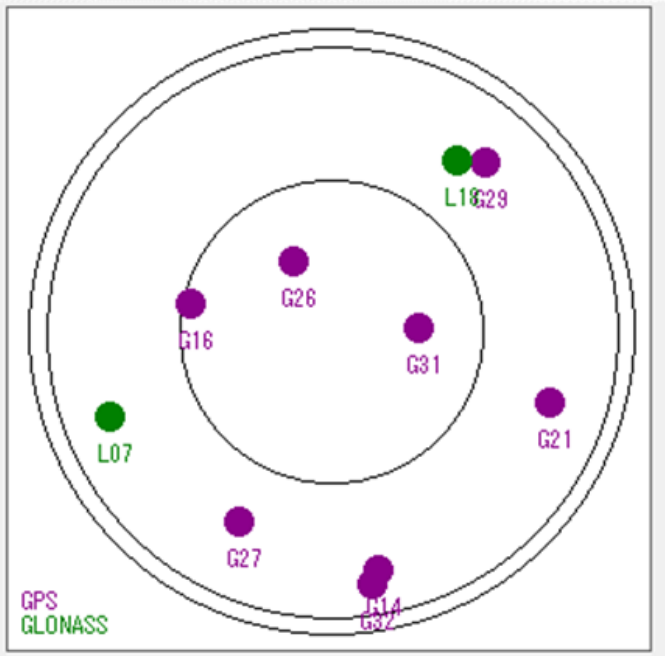




マゼランシステムズジャパン株式会社
Magellan Systems Japan Inc.

Demonstration

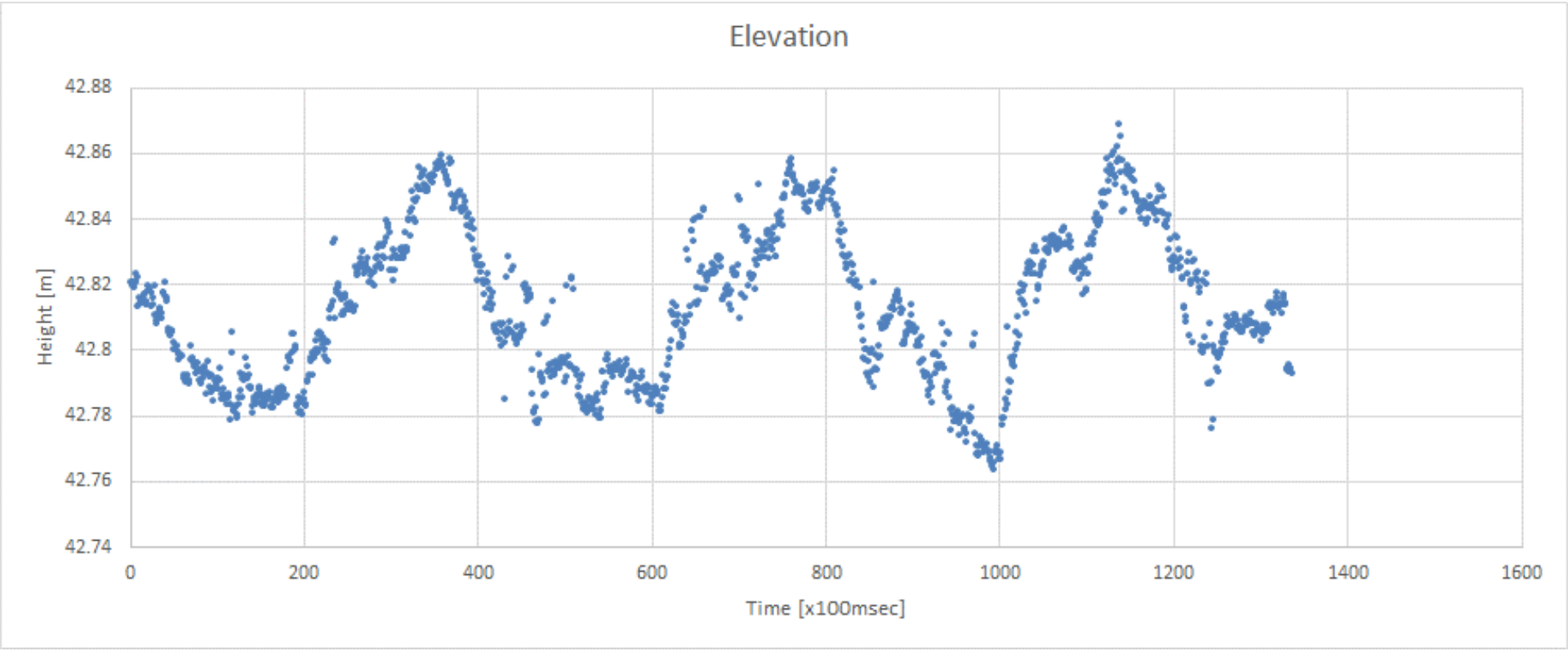




CH	ID	EL	AZ	SNR	INFO
01	G26	66	332	55	U
02	G31	64	088	53	U
03	G16	47	281	53	U
04	G27	27	206	49	U
05	G29	22	042	45	U
06	G21	22	108	48	U
07	G23	90	000	42	
08	G14	18	169	36	U
09	G32	14	171	35	U
10	L19	90	000	49	
11	L09	90	000	47	
12	L16	90	000	42	
13	L18	27	036	46	U
14	L20	90	000	43	
15	L07	19	249	46	U
16	L08	90	000	41	

マゼランシステムズジャパン株式会社
Magellan Systems Japan Inc.

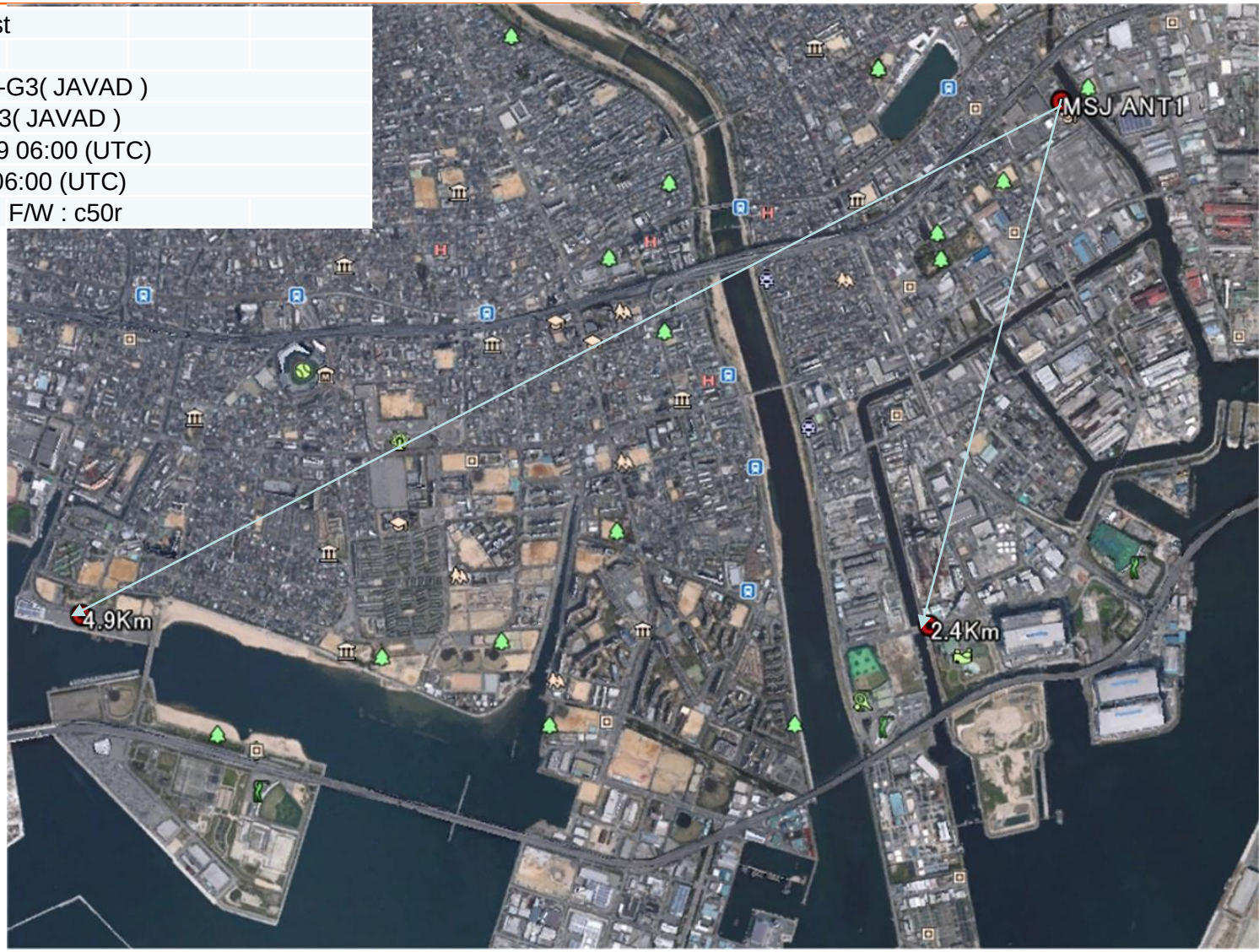
Demonstration



マゼランシステムズジャパン株式会社
Magellan Systems Japan Inc.

Initialization Test (long BL)

GNSS Receiver Initialization Test		
Antenna	BaseStation : GrAnt-G3(JAVAD)	
	Rover : GrAnt-G3(JAVAD)	
Date: 2015/08/18 23:45 ～ 08/19 06:00 (UTC)		
2015/08/19 23:30 ～ 08/20 06:00 (UTC)		
	F/W : c50r	



マゼランシステムズジャパン株式会社
Magellan Systems Japan Inc.

Initialization Test (long BL)

Base Line : 4.9Km

North

East

West

South

Base Line : 2.4Km

North

East

West

South

Initialization Time

	Base Line	
	2.4Km	4.9Km
MAX [sec]	208	292
MIN [sec]	12	19
AVE [sec]	33.82	61.45
Test Count	219	172
TimeOut	0	5
Fix Rate [%]	100	97.1
Wrong Fix	0	0

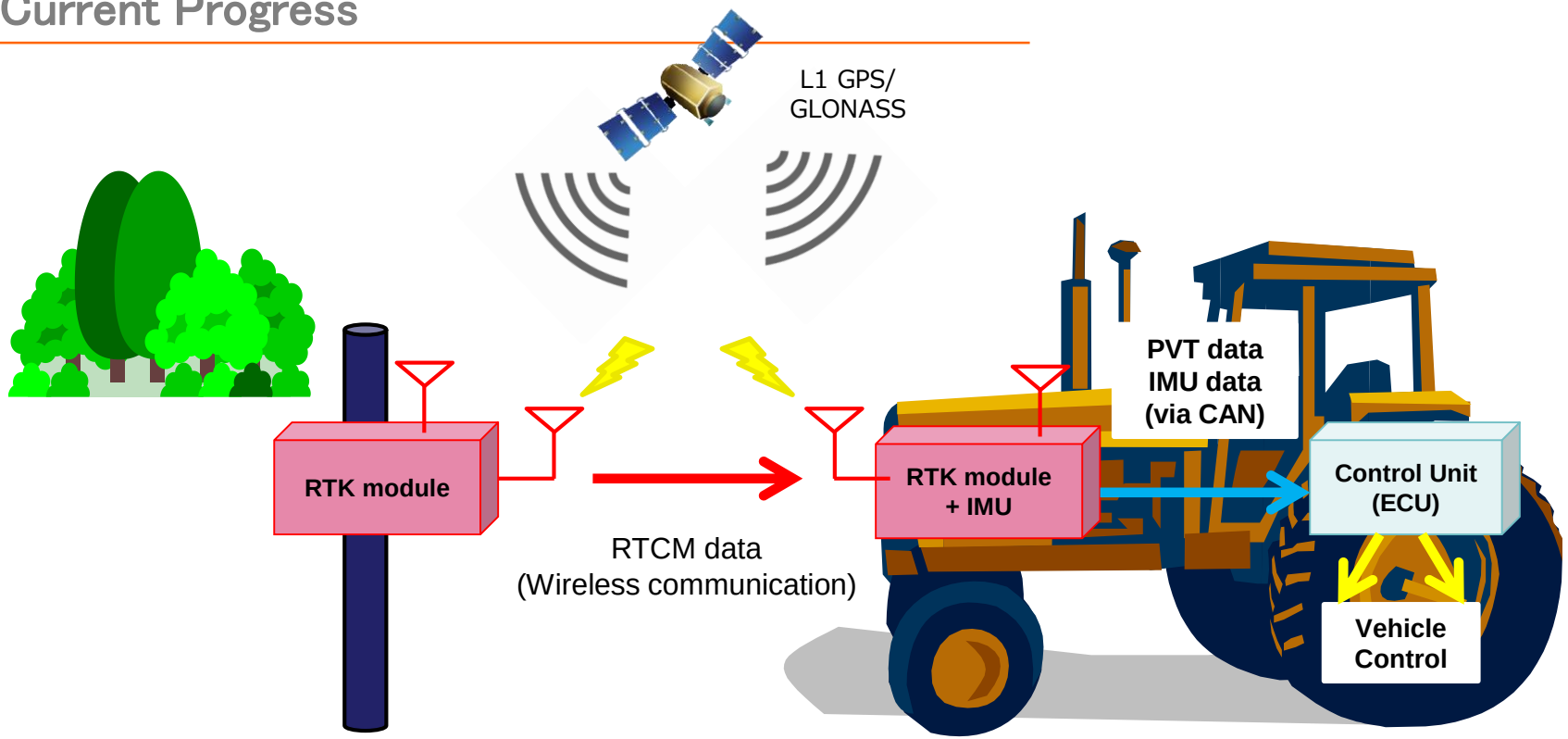
Position Accuracy

	Base Line	
	2.4Km	4.9Km
2drms	1.57cm	1.77cm

2.4Km , 4.9Km での　位置精度の仕様はそれぞれ、
2.4Km :　0.5 + 2400 x 1ppm (rms)　= 0.74cm(rms) = 1.48cm(2drms)
4.9Km :　0.5 + 4900 x 1ppm (rms)　= 0.99cm(rms) = 1.98cm(2drms)

2.4Km地点の精度が若干仕様をオーバーしていますが、許容範囲と考えます。

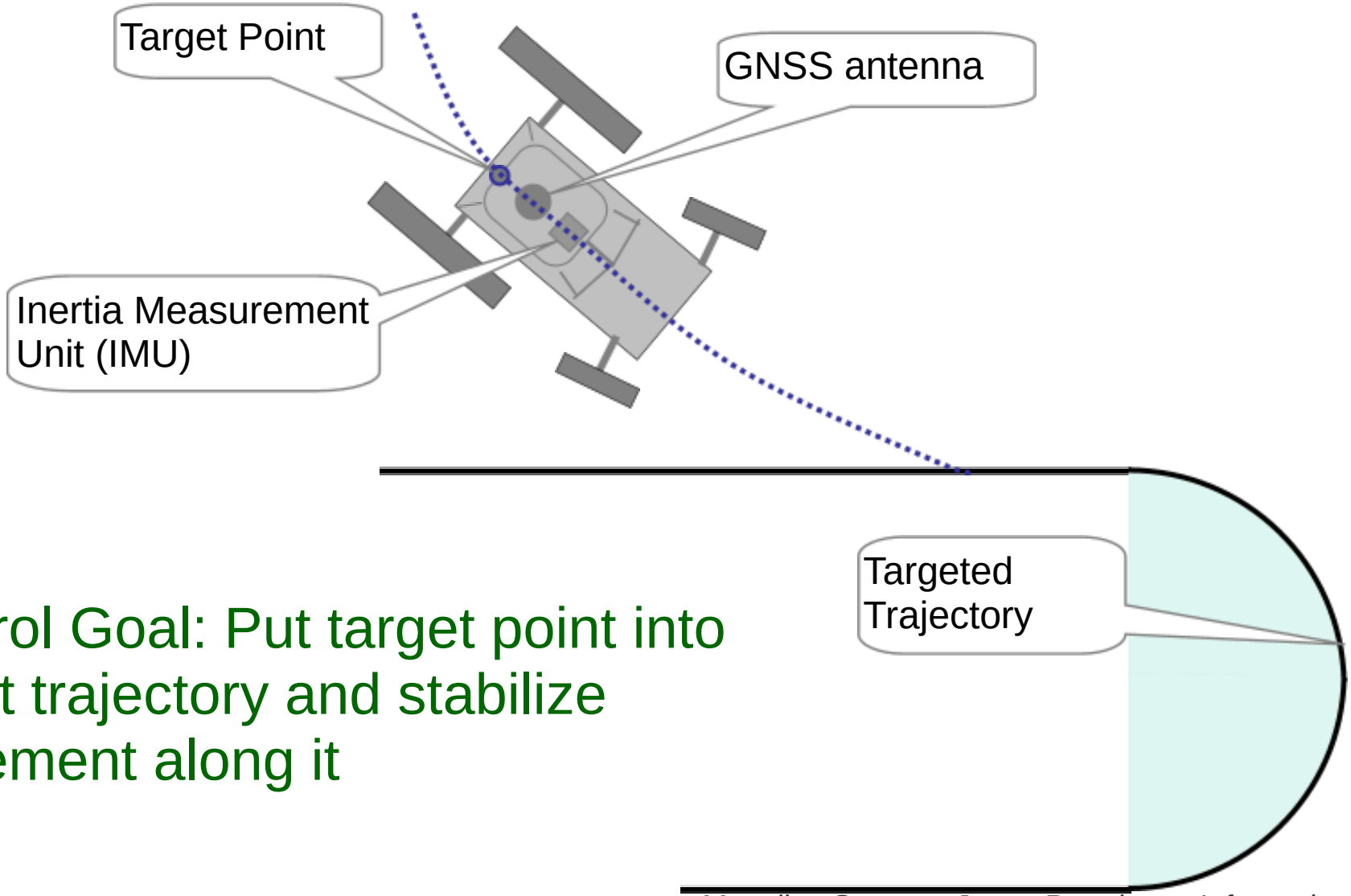
Current Progress



• Magellan Systems Japan develops and provides the RTK module + GNSS antenna for the base station and the RTK module + proprietary IMU motion detection/control algorithm/software + GNSS antenna for the rover. (50Hz RTK module was newly developed in order to support the sophisticated algorithm.)

• The high precision L1 multi-GNSS RTK + IMU module provides accurate PVT information and IMU sensor information, which is compensated by IMU and proprietary algorithm, to the ECU via the CAN bus.

Current Progress



Control Goal: Put target point into target trajectory and stabilize movement along it

Current Progress

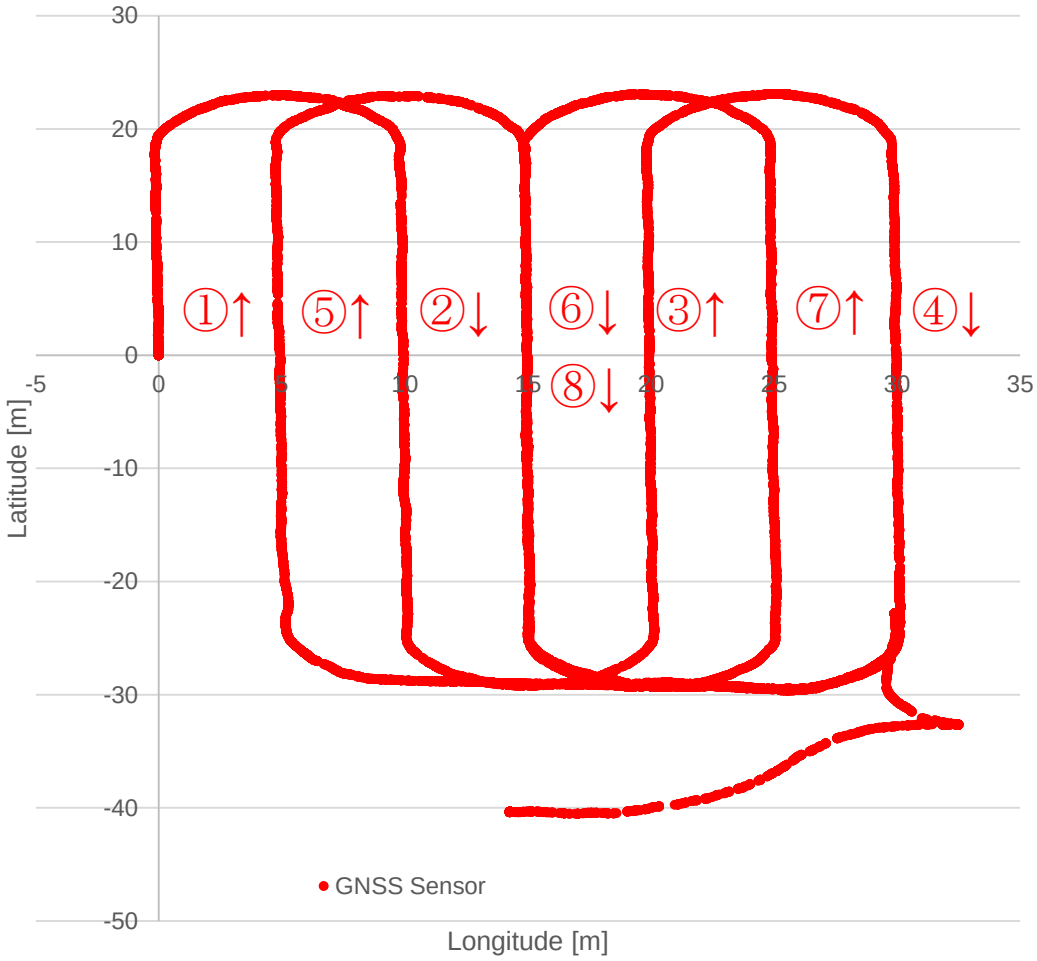
Current Progress

マゼランシステムズジャパン株式会社
Magellan Systems Japan Inc.

Field Tests at University of Hokkaido

マゼランシステムズジャパン株式会社
Magellan Systems Japan Inc.

Comparison Test Results



Comparison Test Results

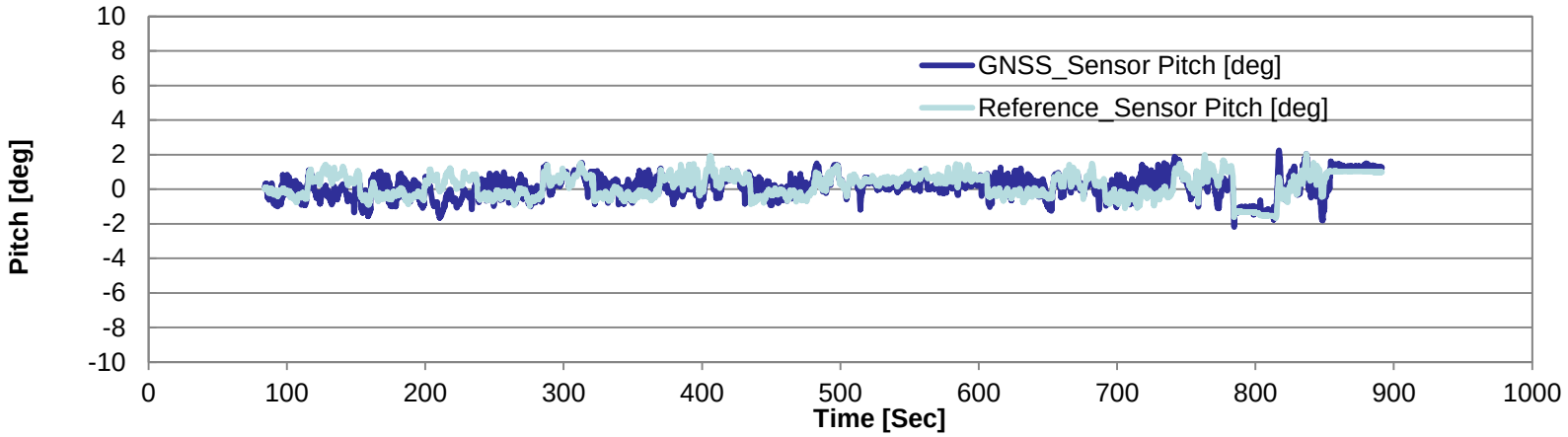
3km/h , full-pass , Cultivate Rotary

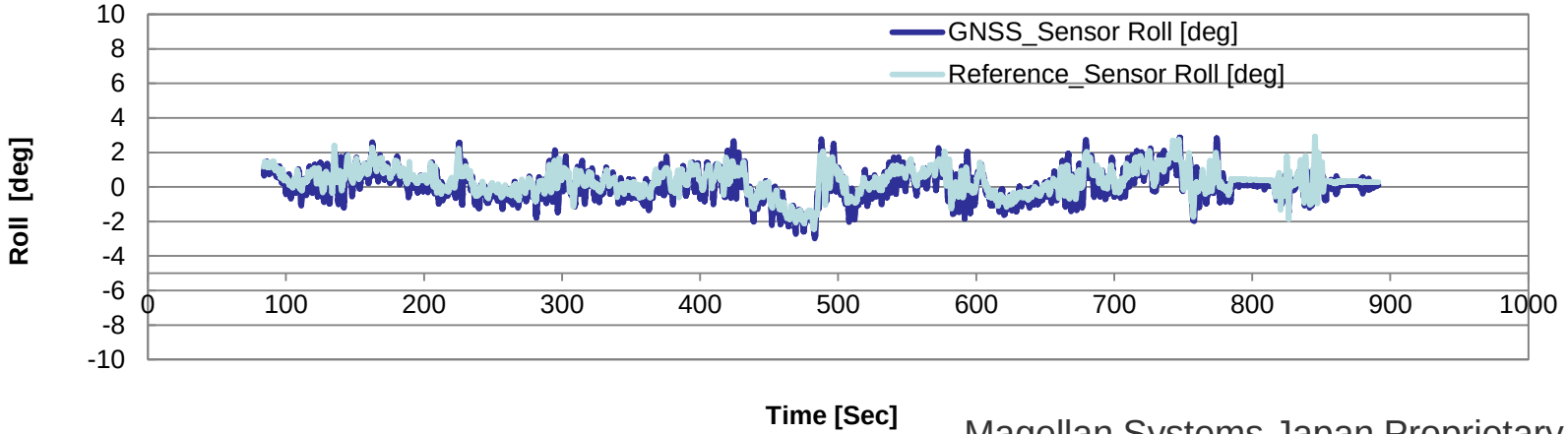
	RMS [m]			
	①50-1100	②1950-3800	③4750-6600	④7700-9200
	0.02492	0.04676	0.03335	0.02153
	⑤11400-12800	⑥13800-15500	⑦16400-18200	⑧19100-20800
	0.04846	0.04031	0.03105	0.03412

マゼランシステムズジャパン株式会社
Magellan Systems Japan Inc.

Comparison Test Results

	Attitude RMS		
	Yaw (deg)	Pitch (deg)	Roll (deg)
	1.90	0.61	0.60





マゼランシステムズジャパン株式会社
Magellan Systems Japan Inc.

Current Progress （from YouTube）

Some Other Applications

マゼランシステムズジャパン株式会社
Magellan Systems Japan Inc.

Future Applications

NEDO Project

Advanced development for to utilize Quasi-Zenith Satellite System

Advanced development for to utilize Quasi-Zenith Satellite System

■Details of New Development

Recent Technologies

測位技術	測位方式	コスト	基地局	測位技術概要	測位精度
コードフェーズ（コード測位）	GPS単独測位	◎	不要	GPS衛星からの信号到達時間差を距離に換算し測位	5m～20m
	DGPS（SBAS利用）	◎	必要（不要）	GPS衛星からの信号＋補正情報を利用して測位	1メートル以下
キャリアフェーズ（搬送波測位）	L1 GPS RTK	○	必要（基線長に制約あり）	GPS衛星からの信号の搬送波をカウント。距離に換算し測位	1cm～10cm程度
	L1マルチGNSS RTK	○	必要（基線長にやや制約）	複数の測位衛星システムからの信号の搬送波をカウント。距離に換算し測位	1cm～10cm程度
	多周波GPS RTK	×	必要（補正データ大）	GPS衛星からの複数の周波数の信号の搬送波をカウント。距離に換算し測位	1cm～10cm程度
	多周波マルチGNSS RTK	×	必要（補正データ大）	複数の測位衛星システムの複数の周波数の信号の搬送波をカウント。距離に換算し測位	1cm～10cm程度

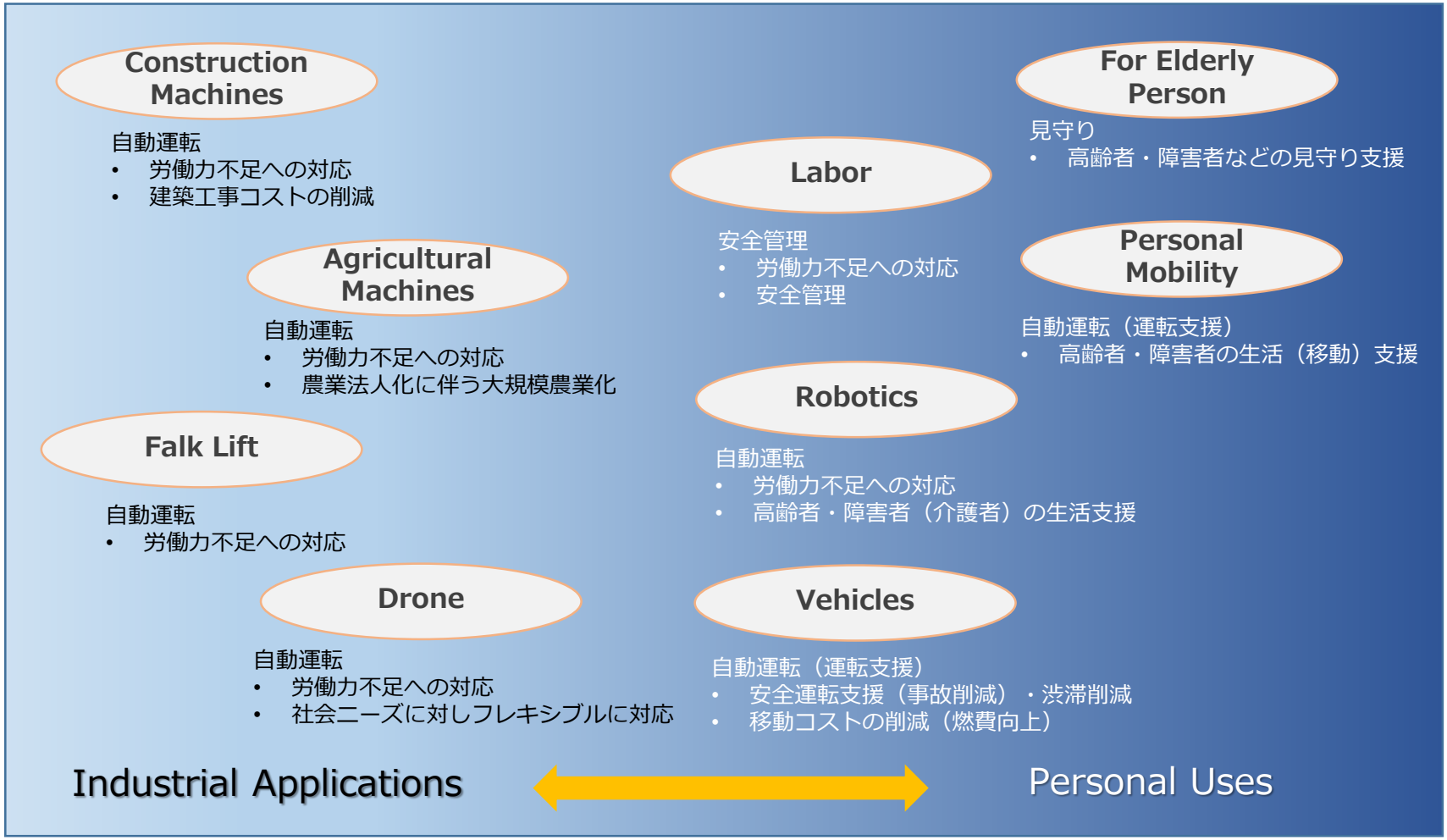
Advanced Technology

測位技術	測位方式	コスト		測位技術概要	測位精度
キャリアフェーズ＋PPP	多周波マルチGNSS RTK＋L6(PPP)	◎	不要	複数の測位衛星システムの複数の周波数の信号の搬送波をカウント＋L6の補正情報を利用。距離に換算し測位	RTK：1cm～10cm程度 PPP：10cm

マゼランシステムズジャパン株式会社
Magellan Systems Japan Inc.

Advanced development for to utilize Quasi-Zenith Satellite System

■ Marketwise



マゼランシステムズジャパン株式会社
Magellan Systems Japan Inc.

Road Map of the Multi-frequency GNSS receiver development

Item	Specification (Step1 Evaluation board)	
Supported Satellite Systems and Signals	GPS	L1, L2, L5
	QZSS	L1, L2, L5, L6
	GLONASS	G1, G2
	Galileo	E1, E5a, E5b, E5, E6
	Beidou	B1, B2
	SBAS	L1
Position Accuracy	Autonomous	1.5 m (RMS) typical
	DGPS (SBAS)	< 1.0 m (RMS)
	Network RTK	
	Dynamic	< 5 cm + 1 ppm x Baseline(< 20 km) (RMS)
	Static	< 0.5 cm + 1 ppm x Baseline(< 20 km) (RMS)
	RTK-PPP	< 10 cm (RMS)
TTFF (Autonomous)	Cold start	90 sec (typical)
	Warm start	35 sec (typical)
	Hot start	12 sec (typical)
	Re-acquisition	2 sec (typical)
Output Rate	10 Hz	
Interface	USB, UART, CAN, Ethernet	
Message Format	NMEA0183 Version 3.0 (Output) RTCM SC104 Version 3.x (Input/Output)	

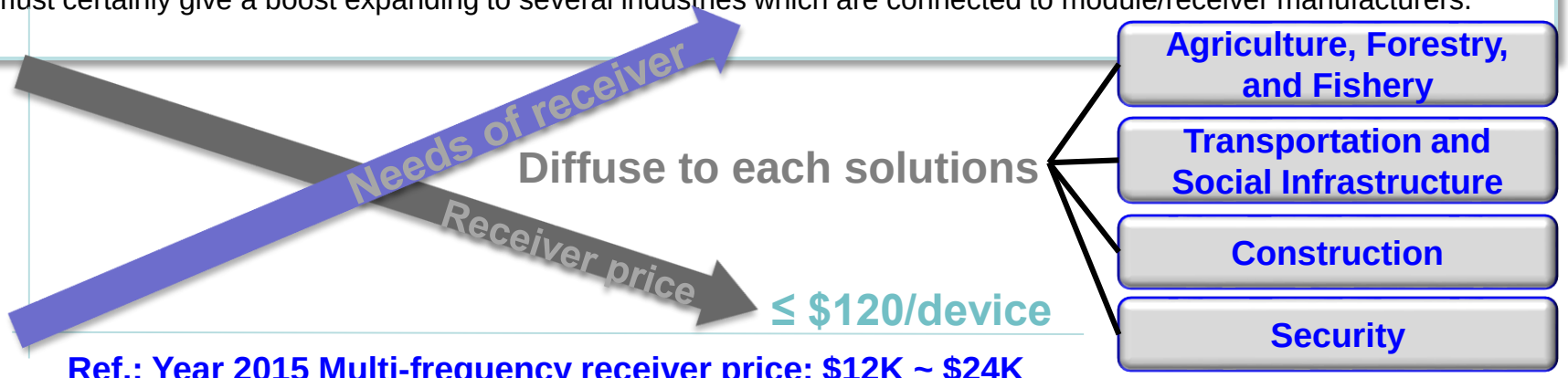
Business Strategy

■ Reduce the cost by using an relationship with industry

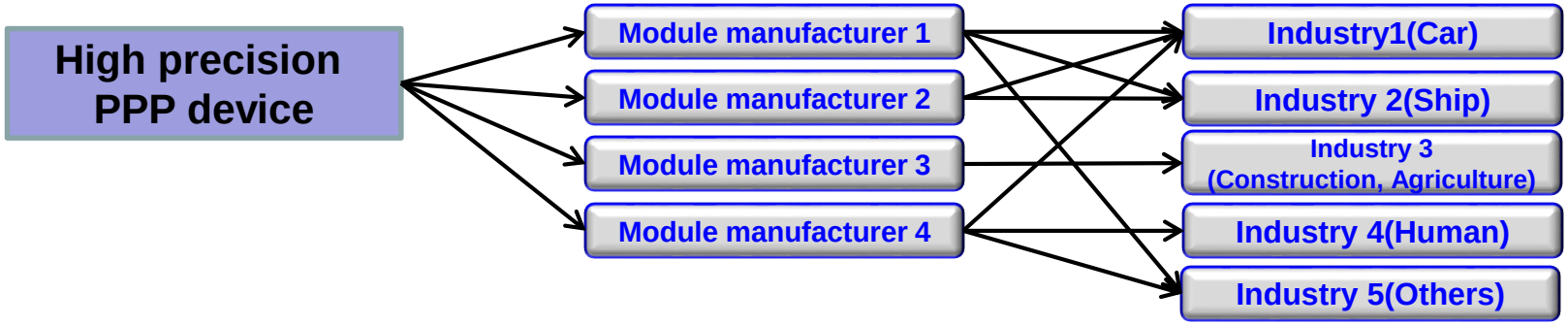
- Our target is to improve the diffusion of GNSS receiver while reducing the cost of GNSS receiver and expand solutions using precise GNSS positioning by using an advantage of relationship with autonomous drive industry we already have.

■ Horizontal Expansion to the industries

- Many manufacturers have been waiting this device to be launched, because there is difficulty to develop the positioning technology. Proceeding with an advanced development for the module manufacturer which has higher possibility to apply this device must certainly give a boost expanding to several industries which are connected to module/receiver manufacturers.



Ref.: Year 2015 Multi-frequency receiver price: $12K ~ $24K



ご清聴、有難う御座いました。

Thank you for your kind attention !